Check List the journal of biodiversity data

ANNOTATED LIST OF SPECIES

Check List 17 (2): 551–568
https://doi.org/10.15560/17.2.551

PENSOFT

Gerromorpha (Insecta, Hemiptera, Heteroptera) from eastern Maranhão state, northeastern Brazil

Cleilton Lima Franco[1*], Juliana Mourão dos Santos Rodrigues[2], Carlos Augusto Silva de Azevêdo[1], Felipe Ferraz Figueiredo Moreira[2]

1 Laboratório de Entomologia Aquática, Centro de Estudos Superiores de Caxias, Universidade Estadual do Maranhão, Caxias, MA, Brazil • CLF: cleiltonubc@hotmail.com, https://orcid.org/0000-0003-1827-773X • CASA: casazevedo08@gmail.com, https://orcid.org/0000-0002-0503-3843

2 Laboratório de Biodiversidade Entomológica, Instituto Oswaldo Cruz, Fundação Oswaldo Cruz, Rio de Janeiro, RJ, Brazil • JMSR: juliana mourao@yahoo.com.br, https://orcid.org/0000-0003-2872-138X • FFFM: ppmeiameiameia@gmail.com, https://orcid.org/0000-0002-6692-0323

* Corresponding author

Abstract

The infraorder Gerromorpha (Insecta, Hemiptera, Heteroptera) comprises semiaquatic bugs, most of which live on the water surface, among floating plants or at the margins of water bodies. We made collections of these insects in the Itapecuru and Parnaíba hydrographical basins in eastern Maranhão state, northeastern Brazil, from January to December 2019. Based on the material obtained, we present new records for 23 species, 20 of which are recorded for the first time from Maranhão state.

Keywords

Aquatic insects, lakes, semiaquatic bugs, streams

Academic editor: Julianna Freires Barbosa | Received 20 November 2020 | Accepted 2 January 2021 | Published 17 March 2021

Citation: Franco CL, Rodrigues JMS, Azevêdo CAS, Moreira FFF (2021) Gerromorpha (Insecta, Hemiptera, Heteroptera) from eastern Maranhão state, northeastern Brazil. Check List 17 (1): 551–568. https://doi.org/10.15560/17.2.551

Introduction

Members of the suborder Heteroptera (Insecta, Hemiptera) are distributed worldwide and occupy a wide variety of habitats (Schuh and Slater 1995; Gullan and Cranston 2017). Among the seven infraorders of Heteroptera, Gerromorpha, Leptopodomorpha, and Nepomorpha are associated with water bodies (Nieser and Melo 1997; Panizzi and Grazia 2015). The semiaquatic bugs of the infraorder Gerromorpha are small to mid-sized insects, usually found on the surface or along the margins of bodies of freshwater (Andersen 1982; Dias-Silva et al. 2013). The more than 2,100 known species of Gerromorpha are currently divided into eight families and approximately 160 genera (Polhemus and Polhemus 2008).

Out of the more than 500 species and 45 genera of Gerromorpha recorded from the Neotropical region (Polhemus and Polhemus 2008), only 11 species have been recorded from Maranhão state, Brazil: *Brachymetra furva* Drake, 1957, *Cylindrostethus palmaris* Drake & Harris, 1934, *Halobates micans* Eschscholtz, 1822 (Gerridae), *Microvelia pulchella* Westwood, 1834, *M. venustatis* Drake & Harris, 1933, *Paravelia cognata* Drake & Harris, 1933, *P. micromaculata* Rodrigues, Moreira,

©The authors. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Nieser, Chen & Melo, 2014, *P. nexa* Drake & Harris, 1933, *P. spinifera* Polhemus & Polhemus, 1984, *Rhagovelia whitei* Breddin, 1898, and *Steinovelia vinnula* Drake, 1951 (Veliidae) (Moreira et al. 2011; Moreira and Campos 2012; Rodrigues et al. 2012, 2014; Rodrigues and Álvarez-Arango 2019; Moreira 2020a, 2020b, 2020c, 2020d, 2020e). We present here new records of Gerromorpha from Maranhão based on material recently collected in the eastern portion of the state.

Study Area

Sampling localities are within two large hydrographical basins, Itapecuru and Parnaíba, in eastern Maranhão state, northeastern Brazil (Fig. 1). The region has a semi-humid equatorial climate, with a mean annual temperature of 28 °C and annual precipitation of 1,100–1,800 mm, which peaks in the rainy season (December–May), while the other half of the year (June–November) encompasses the dry season (Medeiros 2015). The region is dominated by seasonally deciduous forest within areas of Cerrado sensu lato (Lima et al. 2016), with other phytophysiognomies such as rural landscapes, savannas, and seasonal tropical scleromorphic and semideciduous forests (Tannus and Assis 2004; Coutinho 2006; Correia Filho et al. 2011).

Methods

We collected in 25 lotic and lentic environments from January to December 2019 (Figs. 2–4). We collected specimens by active search with the aid of aquatic nets, then fixed and preserved them in 80% ethanol. Material is deposited in the Coleção do Laboratório de Entomologia Aquática, Universidade Estadual do Maranhão, Caxias, Brazil (LEAq). The distribution presented for each species is according to Moreira (2020a, 2020b, 2020c, 2020d, 2020e) and abbreviations of Brazilian states are according to the official standard (IBGE 2020). First records from Maranhão state are marked by an asterisk (*). We took photographs using a Leica M205 C stereomicroscope coupled with a Leica DMC2900 digital camera. We produced the map with QGIS 3.10.7 (QGIS.org 2020).

Results

Family Gerridae
Subfamily Charmatometrinae
Brachymetra Mayr, 1865

***Brachymetra albinervus* (Amyot & Serville, 1843)**
Figure 5A–D

New records. BRAZIL • 1 ♂, 6 ♀; Maranhão, Duque Bacelar, Araim stream; −04.16861, −042.99277; 14 Jul. 2019; C.L. Franco et al. leg.; LEAq 00014 • 2 ♂; Maranhão, Caxias, Areia Branca stream; −05.03720, −043.48580; 13 Aug. 2019; C.L. Franco et al. leg.; LEAq 00056 • 1 ♂, 2 ♀; Maranhão, Caxias, Batatal stream; −04.96166, −043.38916; 07 Aug. 2019; C.L. Franco et al. leg.; LEAq 00007 • 1 ♂, 3 ♀; Maranhão, Caxias, Buriti stream; −04.91500, −043.11333; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00154, 00160 • 1 ♂; Maranhão, Codó, Buriti Dantas stream; −04.70388, −043.83250; 03 Oct. 2019; C.L. Franco et al. leg.; LEAq 00179 • 4 ♂, 7 ♀; Maranhão, Caxias, Cajazeiras stream; −05.01750, −043.42944; 07 Aug. 2019; C.L. Franco et al. leg.; LEAq 00031 • 31 ♂, 50 ♀; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00058, 00062, 00065, 00072, 00079 • 15 ♂, 16 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco

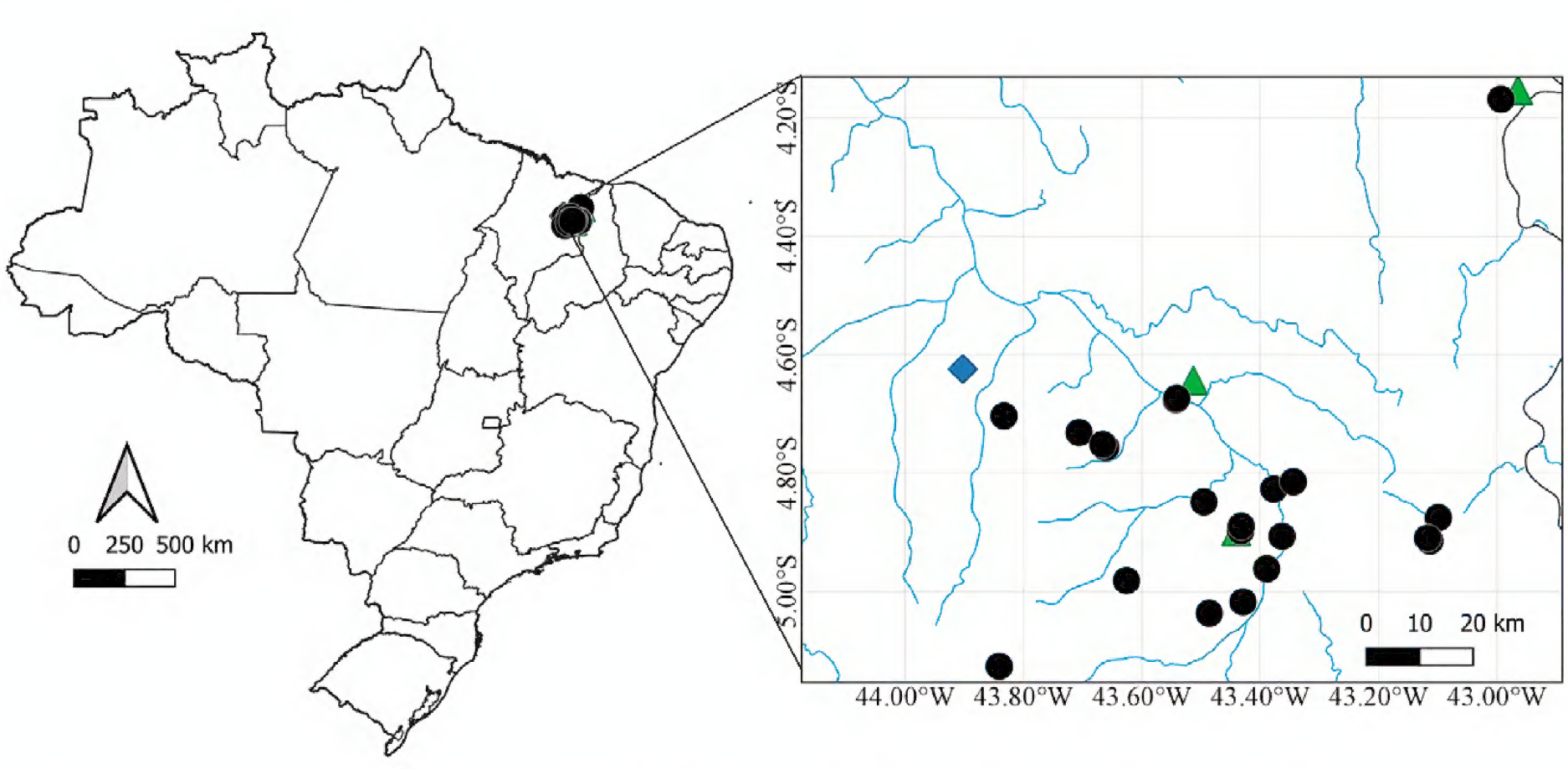

Figure 1. Map showing the location of the sampling sites [streams (black circles), lakes (green triangles) and river (blue rhombus)] in eastern Maranhão state, northeastern Brazil.

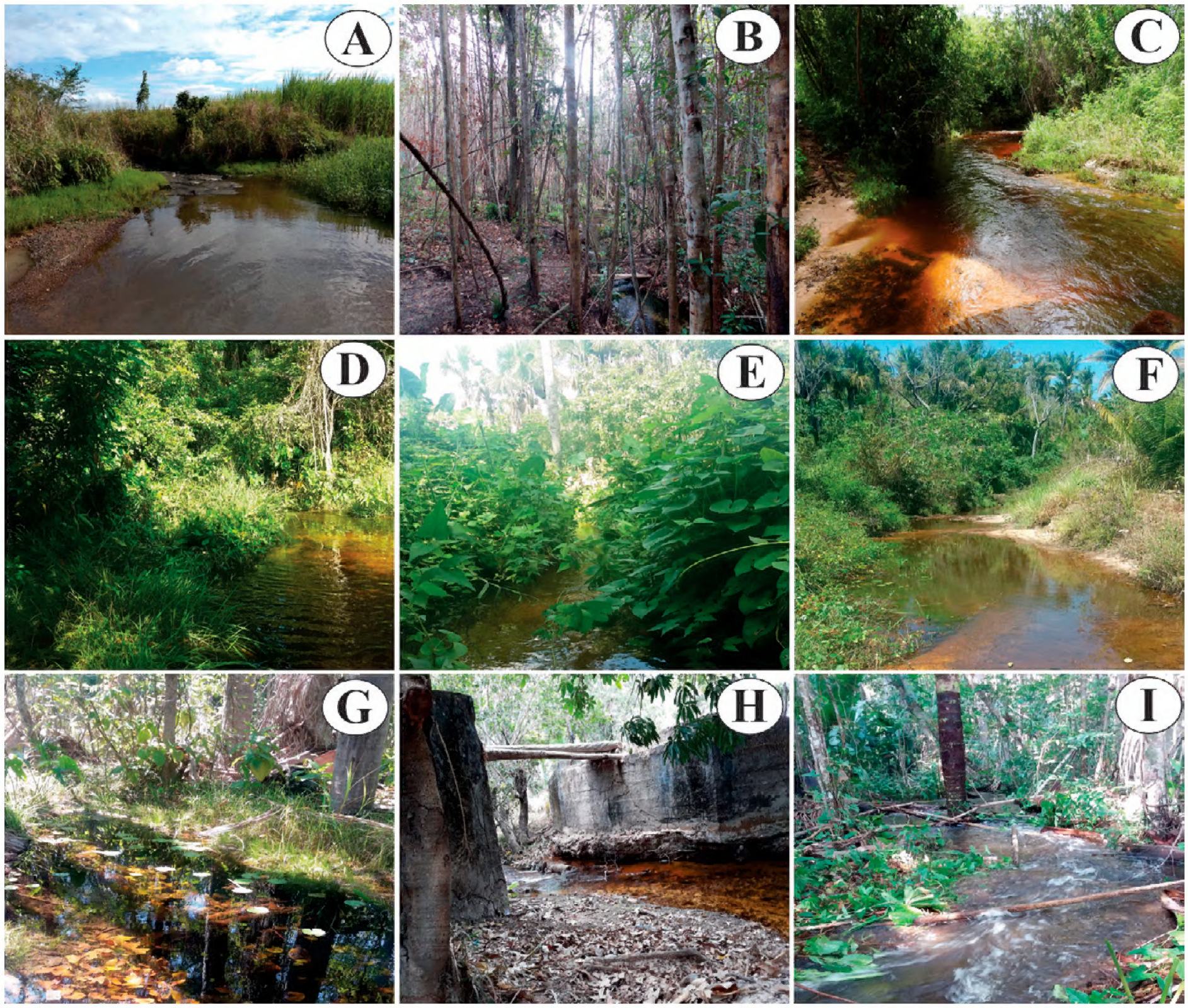

Figure 2. Sampling sites, streams. **A.** Araim. **B.** Areia Branca. **C.** Baixa Grande. **D.** Baixa Grande II. **E.** Barragem. **F.** Batatal. **G.** Buriti. **H.** Buriti Corrente. **I.** Buriti Dantas.

et al. leg.; LEAq 00123, 00130, 00137, 00142, 00146, 00240 • 1 ♂, 2; Maranhão, Merim Lagoon; −04.89861, −043.44027; 13 Aug. 2019; C.L. Franco et al. leg.; LEAq 00052 • 9 ♂, 7 ♀; Maranhão, Caxias, Lamego stream; −04.81527, −043.34361; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00033, 00035, 00039 • 6 ♂, 30 ♀; Maranhão, Caxias, Limpeza stream; −04.67611, −043.54222; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00094, 00097, 00102, 00104 • 6 ♂, 7 ♀; Maranhão, Caxias, Planaçucar stream; −04.90666, −043.36250; 12 Aug.2019; C.L. Franco et al. leg.; LEAq 00044, 00047 • 1 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00219 • 1 ♂, 5 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00001, 00270 • 2 ♂; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00278.

Identification. Our specimens were identified based on the following characters: antennomere I shorter than II and III together; eye not surpassing the anterolateral angle of the pronotum; pronotum with apex rounded, reaching the mesoacetabulum in the apterous form (Fig. 5A); dorsum of acetabula with silvery setae (Fig. 5A, C); fore femur robust and slightly arched, with sparse conical black setae ventrally (Fig. 5B); and male abdominal segment VIII in natural position with about half of its length exposed (Fig. 5B, D). This combination of characters distinguishes them from all known congeners (Cordeiro 2017).

Distribution in Brazil. AM, PA, MA*, CE, BA, MT, MG, SP, RJ.

Brachymetra lata Shaw, 1933

Figure 5E–G

New records. BRAZIL • 1 ♂, 8 ♀; Maranhão, Caxias, Inhamum stream; −04.89833, −043.43333; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00016–00019, 00086 • 2 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00269, 00281 • 1 ♂; Maranhão, Caxias, Planaçucar stream; −04.90666, −043.36250; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00048 • 6 ♂, 5 ♀; Maranhão, São João do Soter, Pedras stream; −04.98194, −043.62638; 07

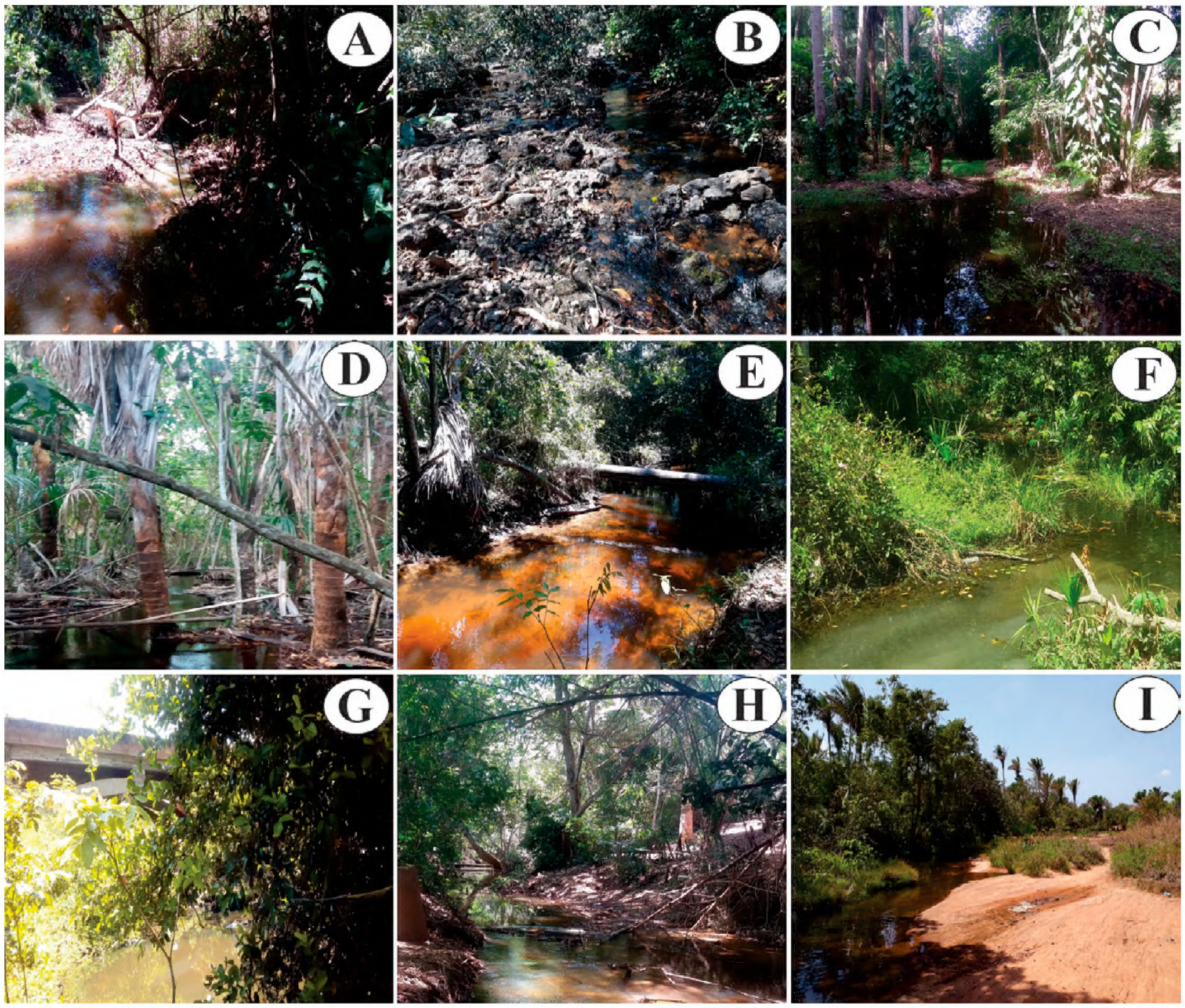

Figure 3. Sampling sites, streams. **A.** Cajazeiras. **B.** Correntinho. **C.** Fonte Mariana. **D.** Inhamum. **E.** Jatobá. **F.** Lamego. **G.** Limpeza. **H.** Planaçucar. **I.** Poção.

Jun. 2019; C.L. Franco et al. leg.; LEAq 00006.

Identification. Our specimens of *B. lata* can be distinguished from *B. albinervus* and other species of the genus based on the eye surpassing the anterolateral angle of the pronotum (Fig. 5E); the quadrate posterior margin of the pronotum (Fig. 5E); the lack of silvery setae on the dorsum of the acetabula (Fig. 5E, G); and the fore femur slender, densely covered by conical black setae on the venter (Cordeiro 2017).

Distribution in Brazil. RR, AP, AM, PA, RO, MA*, MT.

Subfamily Cylindrostethinae
Cylindrostethus Mayr, 1865

***Cylindrostethus palmaris* Drake & Harris, 1934**
Figure 5H–K

New records. BRAZIL • 2 ♂; Maranhão, Duque Bacelar, Araim stream; −04.16861, −042.99277; 14 Jul. 2019; C.L. Franco et al. leg.; LEAq 00012 • 26 ♂, 14 ♀; Maranhão, Caxias, Areia Branca stream; −05.03720S, −043.48580; 13 Aug. 2019; C.L. Franco et al. leg.; LEAq 00055 • 1 ♂, 1 ♀; Maranhão, Caxias, Baixa Grande stream; −04.75722, −043.66055; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00029 • 3 ♂, 1 ♀; Maranhão, Codó, Baixa Grande II stream; −04.73222, −043.70638; 05 Oct. 2019; C.L. Franco et al. leg.; LEAq 00191, 00193 • 2 ♂, 1 ♀; Maranhão, Caxias, Barragem stream; −04.87562, −043.09894; 10 Dec. 2019; C.L. Franco et al. leg.; LEAq 00238 • 5 ♂, 1 ♀; Maranhão, Caxias, Batatal stream; −04.96166, −043.38916; 07 Aug. 2019; C.L. Franco et al. leg.; LEAq 00009 • 3 ♂, 1 ♀; Maranhão, Caxias, Buriti stream; −04.91500, −043.11333; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00159, 00165 • 3 ♂, 1 ♀; Maranhão, Caxias, Cajazeiras stream; −05.01750, −043.42944; 07 Aug. 2019; C.L. Franco et al. leg.; LEAq 00030 • 2 ♂, 7 ♀; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00057, 00064, 00071, 00077 • 29 ♂, 31 ♀; Maranhão, Caxias, Inhamum stream; −04.89833, −043.43333; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00020–00024, 00085, 00091 • 19 ♂, 11 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00121, 00128, 00136, 00141,

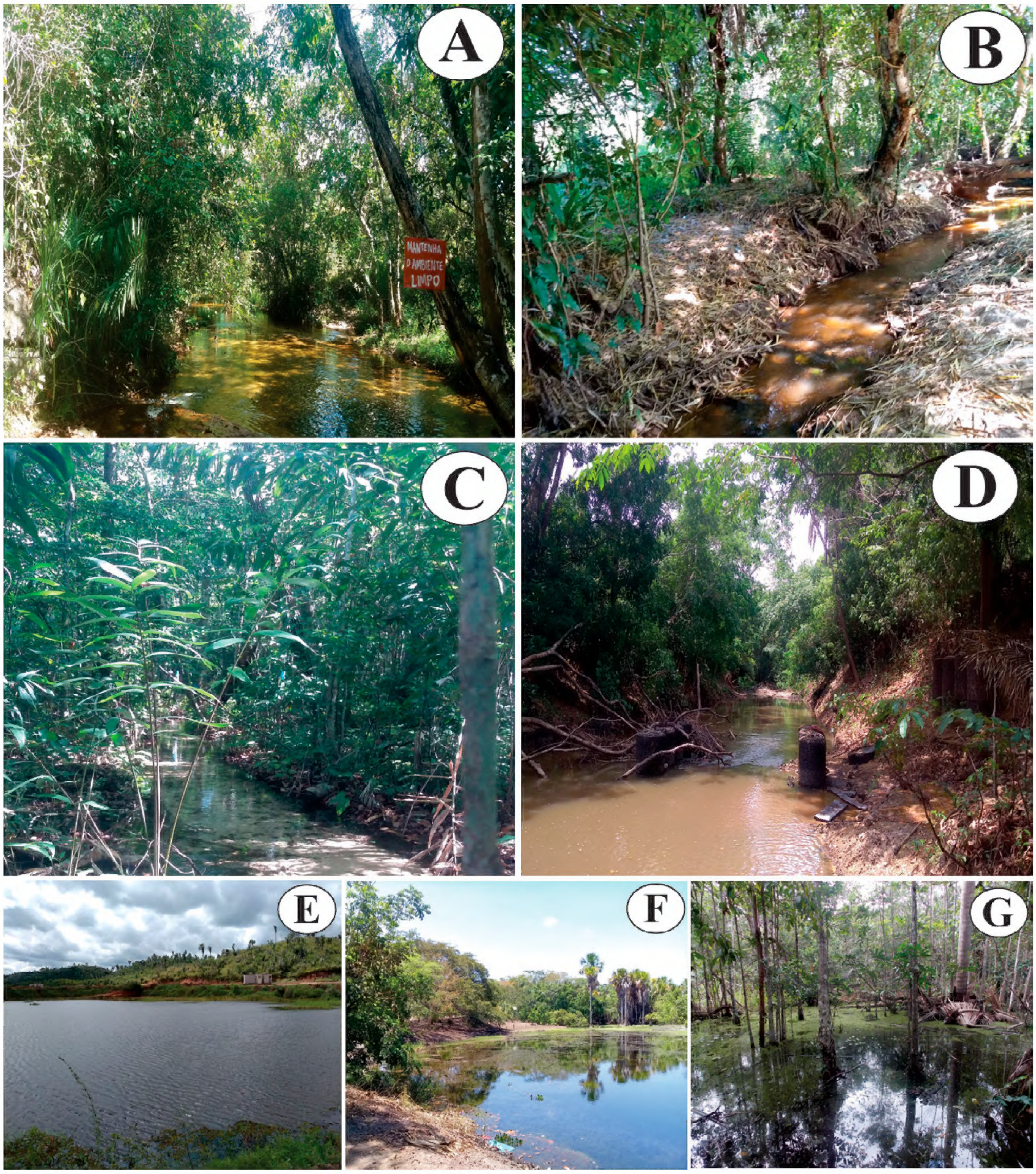

Figure 4. Sampling sites. **A–D.** Streams. **A.** Primavera. **B.** Pedra. **C.** Sumidouro. **D.** Saco River. **E–G.** Lakes. **E.** Araim. **F.** Cheio d'água. **G.** Do Merim.

00144 • 1 ♂; Maranhão, Merim Lagoon; −04.89861, −043.44027; 13 Aug. 2019; C.L. Franco et al. leg.; LEAq 00051 • 26 ♂, 11 ♀; Maranhão, Caxias, Lamego stream; −04.81527, −043.34361; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00032, 00036, 00038 • 3 ♂, 2 ♀; Maranhão, Caxias, Limpeza stream; −04.67611, −043.54222; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00092, 00101 • 8 ♂, 9 ♀; Maranhão, Caxias, Planaçucar stream; −04.90666, −043.36250; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00045–00046, 00049 • 6 ♂ 2 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00200, 00220 • 4 ♂, 2 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00002, 00173 • 14 ♂, 10 ♀; Maranhão, Caxias, Sumidouro stream; −04.88972, −043.43166; 05 Aug. 2019; C.L. Franco et al. leg.; LEAq 00027–00028.

Identification. *Cylindrostethus palmaris* is the only South American species of the genus that displays wing dimorphism, with apterous and macropterous morphs (Fig. 5H, J). Other species from the continent are entirely apterous, which makes identification of winged

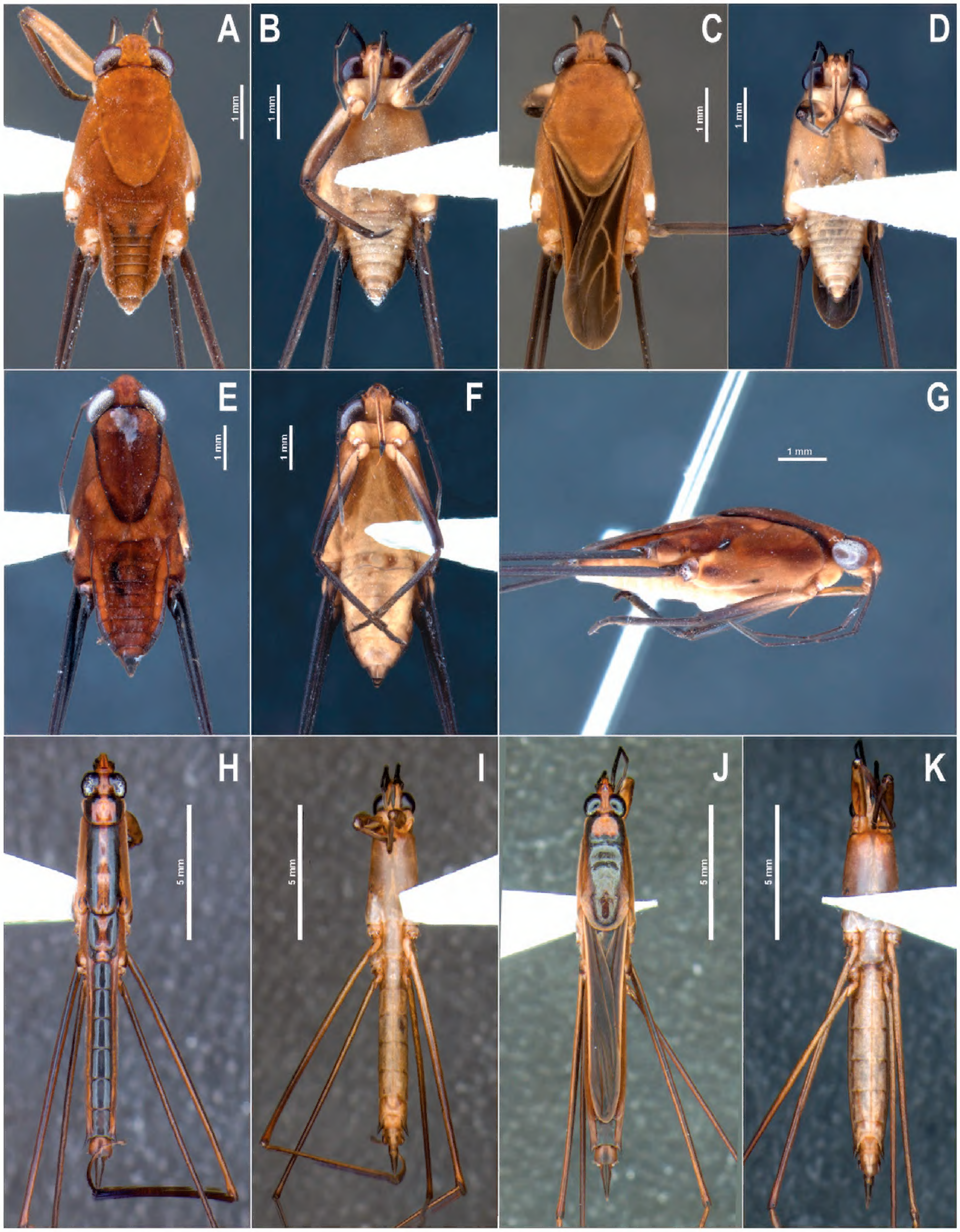

Figure 5. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–D.** *Brachymetra albinervus*. **A, B.** Apterous male. **A.** Dorsal view. **B.** Ventral view. **C, D.** Macropterous male. **C.** Dorsal view. **D.** Ventral view. **E–G.** *Brachymetra lata*, apterous female. **E.** Dorsal view. **F.** Ventral view. **G.** Lateral view. **H–K.** *Cylindrostethus palmaris*. **H, I.** Apterous male. **H.** Dorsal view. **I.** Ventral view. **J, K.** Macropterous male. **J.** Dorsal view. **K.** Ventral view.

specimens immediate (Floriano et al. 2016). Our apterous specimens were identified based on the body mostly yellow; the lateral black stripes of the mesonotum as wide as the median yellow stripe (Fig. 5H); the black fore tibia; the posterior margin of male abdominal sternum VII emarginated at the middle (Fig. 5I); and the basolateral processes of the male proctiger distinctly shorter than wide (Floriano et al. 2016).

Distribution in Brazil. RR, AP, AM, PA, RO, MA, RN, BA, MT, GO, MS, MG, ES, SP, RJ.

Comments. Previously recorded in Maranhão from the municipalities of Timon and Imperatriz (Rodrigues et al. 2012; Floriano et al. 2016).

Subfamily Gerrinae

Tribe Gerrini

Limnogonus Stål, 1868

***Limnogonus recurvus* Drake & Harris, 1930**

Figure 6A–C

New records. BRAZIL • 2 ♂, 3 ♀; Maranhão, Caxias, Buriti stream; −04.91500, −043.11333; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00152, 00167 • 1 ♂, 1 ♀; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00081 • 1 ♀; Maranhão, Caxias, Inhamum stream; −04.89833, −043.43333; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00026 • 1 ♂, 1 ♀; Maranhão, Merim Lagoon; −04.89861, −043.44027; 13

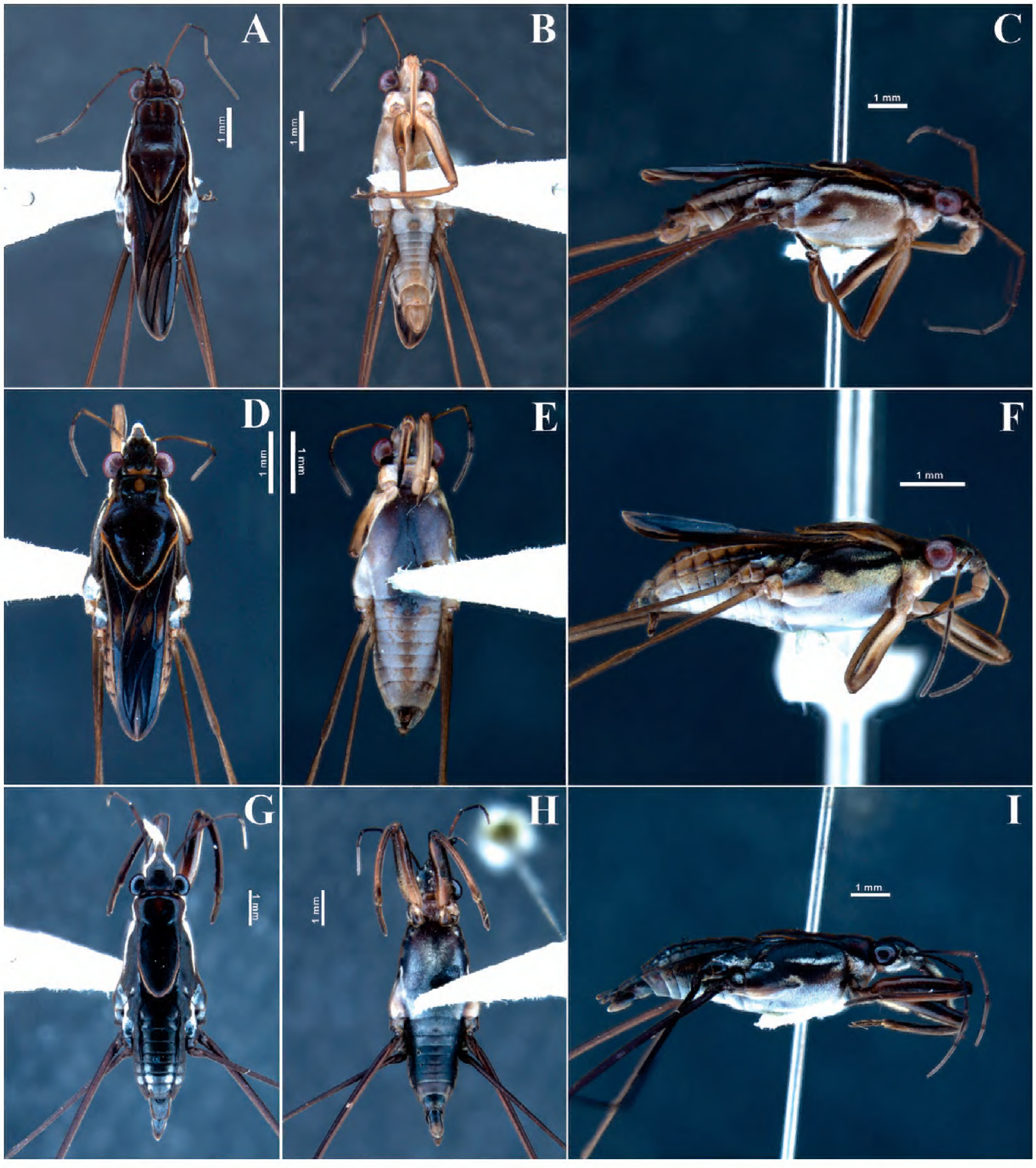

Figure 6. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–C.** *Limnogonus recurvus*, macropterous male. **A.** Dorsal view. **B.** Ventral view. **C.** Lateral view. **D–F.** *Neogerris lubricus*, macropterous female. **D.** Dorsal view. **E.** Ventral view. **F.** Lateral view. **G–I.** *Neogerris magnus*, apterous male. **G.** Dorsal view. **H.** Ventral view. **I.** Lateral view.

Aug. 2019; C.L. Franco et al. leg.; LEAq 00050 • 1 ♂; Maranhão, Caxias, Lamego stream; −04.81527, −043.34361; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00040 • 2 ♀; Maranhão, Caxias, Planaçucar stream; −04.90666, −043.36250; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00042 • 1 ♂, 1 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00116 • 1 ♂, 2 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00201.

Identification. Our males of *L. recurvus* can be recognized by the presence of a rounded gibbosity on the venter of abdominal segment VIII, in addition to a posterior curved spine-like projection. Both males and females have the mesopleuron brown with a lighter stripe of variable size (Fig. 6C) (Nieser and Melo 1997).

Distribution in Brazil. AM, PA, RO, MA*, PE, BA, MT, MG, SP.

Neogerris Matsumura, 1913

***Neogerris lubricus* (White, 1879)**
Figure 6D–F

New records. BRAZIL • 1 ♀; Maranhão, São João do Soter, Fonte Mariana stream; −05.12666, −043.84111; 23 Dec. 2019; C.L. Franco et al. leg.; LEAq 00246 • 1 ♀ Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00280.

Identification. We identified our females based on the body length about 5.00 mm in the macropterous form (Fig. 6D) and the shape of the last abdominal laterotergite in lateral view (Nieser 1994: Fig. 12).

Distribution in Brazil. AP, AM, PA, RO, MA*, PI, BA, MT, MS, MG, SP, RJ.

***Neogerris magnus* (Kuitert, 1942)**
Figure 6G–I

New records. BRAZIL • 4 ♂, 2 ♀; Maranhão, São João do Soter, Fonte Mariana stream; −05.12666, −043.84111; 23 Dec. 2019; C.L. Franco et al. leg.; LEAq 00244, 00247, 00254 • 4 ♂, 1 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00243.

Identification. Specimens of *N. magnus* are the largest of the genus in the Americas and can be readily identified based on the body length of at least 7.50 mm in the apterous form (Fig. 6G) and 8.25 mm in the macropterous form (Nieser 1994).

Distribution in Brazil. AP, AM, PA, MA*, MT.

Tribe Tachygerrini
Tachygerris Drake, 1957

***Tachygerris adamsoni* (Drake, 1942)**
Figure 7A–C

New records. BRAZIL • 1 ♂, 2 ♀; Maranhão, Caxias, Barragem stream; −04.87562, −043.09894; 10 Dec. 2019; C.L. Franco et al. leg.; LEAq 00245, 00256.

Identification. Our male specimen was identified based on the venter of the fore femur without a basal tubercle (Fig. 7B), but instead with a fringe of setae on this area. The females have the posterior margin of abdominal sternum VII without projections, distinctly shorter than the posterior projection of the last abdominal laterotergite (Nieser 1970; Morales-Castaño and Molano-Rendón 2009).

Distribution in Brazil. AM, PA, MA*, PI, MT, MG, RJ.

Subfamily Rhagadotarsinae
Rheumatobates Bergroth, 1892

***Rheumatobates bonariensis* (Berg, 1898)**

New records. BRAZIL • 38 ♂, 22 ♀; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00277.

Identification. Our material was identified based on the males, which bear antennomere I not incrassate, longer than the others; fore femur without anterior tuft of stout setae or ventral row of long stout spines; hind femur straight; and venter of abdominal segments VII–VIII deeply longitudinally grooved (Hungerford 1954).

Distribution in Brazil. MA*, MT, SP, SC, RS.

Subfamily Trepobatinae
Tribe Trepobatini
Halobatopsis Bianchi, 1896

***Halobatopsis platensis* (Berg, 1879)**
Figure 7D, E

New records. BRAZIL • 1 ♂; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00070 • 4 ♂, 3 ♀; Maranhão, Caxias, Limpeza stream; −04.67611, −043.54222; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00099 • 1 ♀; Maranhão, Caxias, Planaçucar stream; −04.90666, −043.36250; 12 Aug. 2019; C.L. Franco et al. leg.; LEAq 00043 • 3 ♂, 10 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00110, 00117, 00203, 00205, 00268 • 1 ♀; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00279.

Identification. Our material was identified based on the following characters: mesonotum of the apterous form with longitudinal black marks (Fig. 7D); male abdominal segment VIII without a ventral spine; and female abdominal laterotergites slightly elevated, not reflected over the mediotergites (Nieser and Melo 1999).

Distribution in Brazil. MA*, PI, BA, MT, GO, DF, MS, MG, ES, SP, RJ, PR, RS.

Family Hebridae
Subfamily Hebrinae
Merragata White, 1877

***Merragata hebroides* White, 1877**
Figure 7F, G

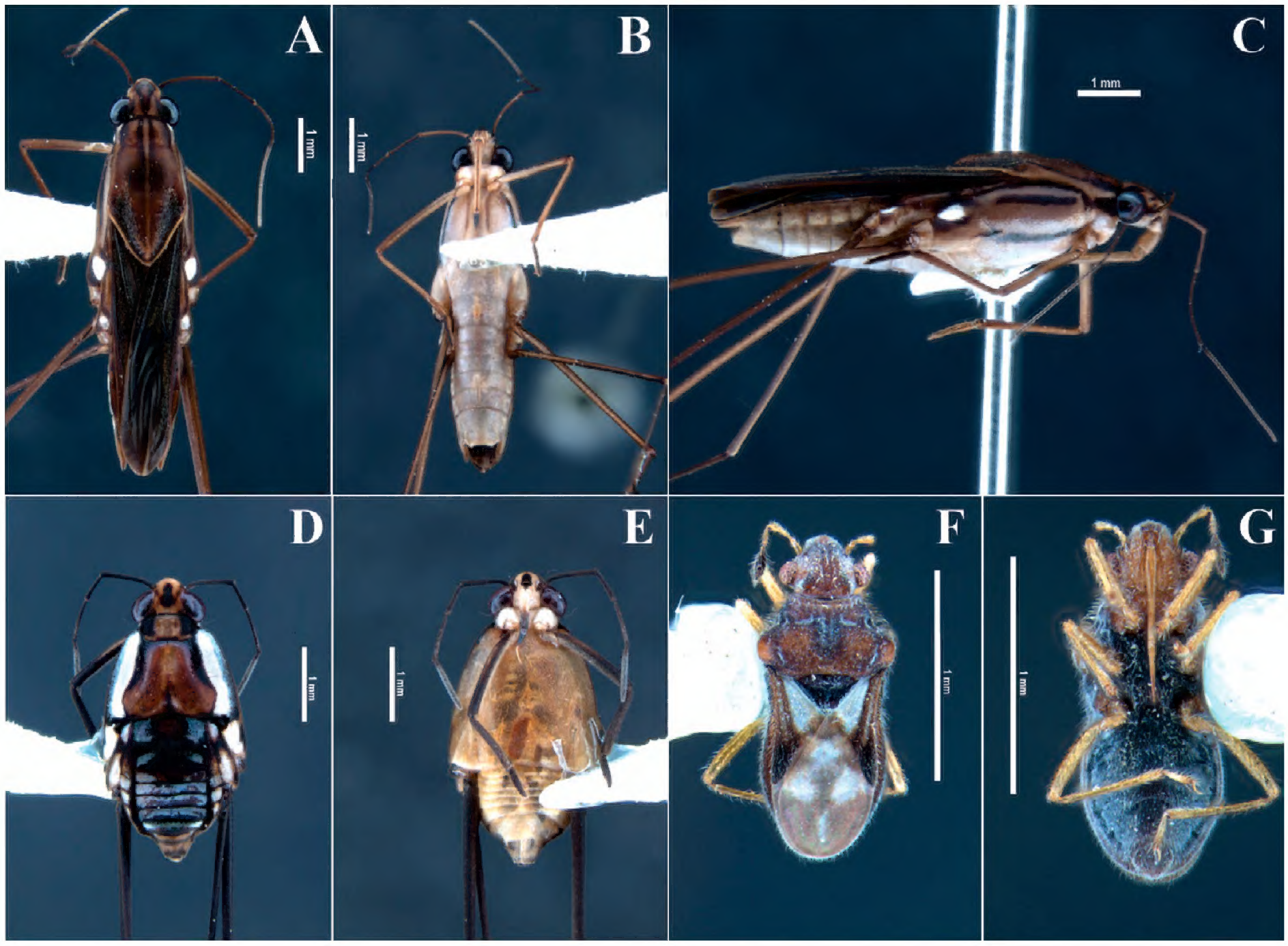

Figure 7. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–C.** *Tachygerris adamsoni*, macropterous female. **A.** Dorsal view. **B.** Ventral view. **C.** Lateral view. **D, E.** *Halobatopsis platensis*, apterous female. **D.** Dorsal view. **E.** Ventral view. **F, G.** *Merragata hebroides*, macropterous male. **F.** Dorsal view. **G.** Ventral view.

New records. BRAZIL • 1 ♂ Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00209.

Identification. Our only specimen was identified based on the shape of the paramere, which was figured by Drake and Chapman (1958: 320).

Distribution in Brazil. AM, MA*, MT, MS.

Family Hydrometridae
Subfamily Hydrometrinae
Hydrometra Latreille, 1797

Hydrometra guianana Hungerford & Evans, 1934

Figure 8A–E

New records. BRAZIL • 2 ♂, 4 ♀; Maranhão, São João do Soter, Fonte Mariana stream; −05.12666, −043.84111; 23 Dec. 2019; C.L. Franco et al. leg.; LEAq 00248–00250.

Identification. Our material was identified based on the clypeus broad, with anterior margin medially angulated (Fig. 8B); pro- and mesoacetabula with circular punctures (Fig. 8E); and the posterior half of male abdominal sternum VI with brushes of setae (Moreira and Barbosa 2013).

Distribution in Brazil. AM, PA, MA*, MT.

Family Mesoveliidae
Subfamily Mesoveliinae
Mesovelia Mulsant & Rey, 1852

Mesovelia amoena Uhler, 1894

Figure 9A, B

New records. BRAZIL • 3 ♀; Maranhão, São João do Soter, Fonte Mariana stream; −05.12666, −043.84111; 23 Dec. 2019; C.L. Franco et al. leg.; LEAq 00253, 00259.

Identification. Our females of this species were identified based on the body brown and around 2.00 mm long (Fig. 9A), and the middle femur without spines on the posterior surface (Fig. 9B) (Moreira et al. 2008).

Distribution in Brazil. AM, PA, RO, MA*, CE, BA, MT, MG, ES, SP, RJ.

Mesovelia mulsanti White, 1879

Figure 9C, D

New records. BRAZIL • 2 ♀; Maranhão, Codó, Baixa Grande II stream; −04.73222, −043.70638, 05 Oct. 2019; C.L. Franco et al. leg.; LEAq 00195 • 1 ♂, 3 ♀; Maranhão, Duque Bacelar, Araim lagoon; −04.15388, −042.96405; 14 Jun. 2019; C.L. Franco et al. leg.; LEAq 00171 • 11 ♂, 4 ♀; Maranhão, Aldeias Altas, Cheio d'água lagoon; −04.64352, −043.51263; 20 Sep. 2019; C.L. Franco et al. leg.; LEAq 00235–00236.

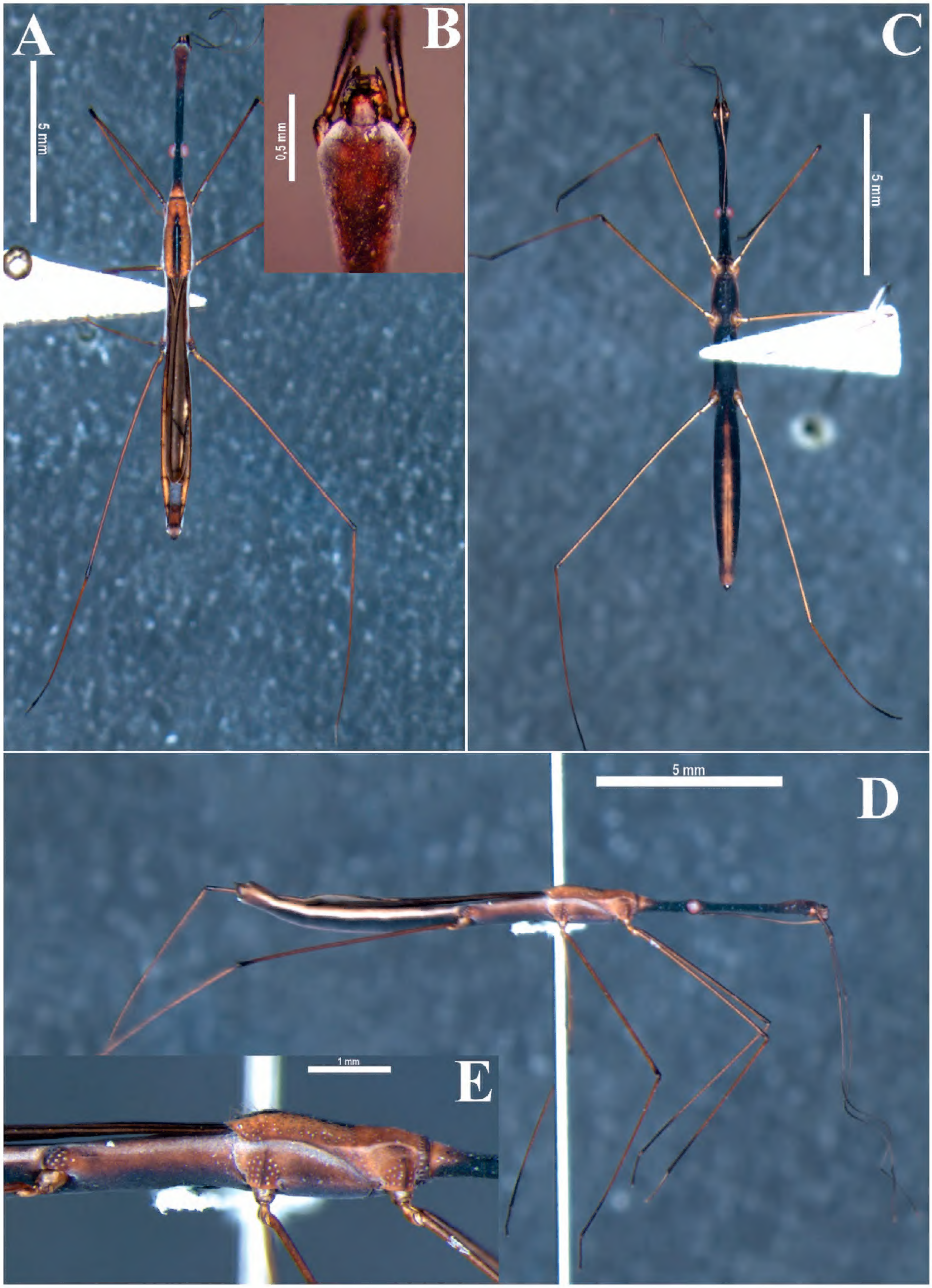

Figure 8. Gerromorpha from eastern Maranhão state, northeastern Brazil. *Hydrometra guianana*, macropterous female. **A.** Dorsal view. **B.** Anterior portion of head, dorsal view. **C.** Ventral view. **D.** Lateral view. **E.** Thorax, lateral view.

Figure 9. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A, B.** *Mesovelia amoena*, apterous female. **A.** Dorsal view. **B.** Ventral view. **C, D.** *Mesovelia mulsanti*, macropterous male. **C.** Dorsal view. **D.** Ventral view.

Identification. Unlike *M. amoena*, our males and females of *M. mulsanti* bear a row of black spinules on the middle femur (Fig. 9C). Additionally, males have a pair of tightly packed clusters of black spinules on the venter of abdominal segment VIII (Fig. 9D) (Spangler 1990; Moreira et al. 2008).

Distribution in Brazil. AP, AM, PA, RO, MA*, CE, PE, BA, MT, GO, MS, MG, ES, SP, RJ, PR, SC, RS.

Family Veliidae
Subfamily Microveliinae
Microvelia Westwood, 1834

***Microvelia mimula* White, 1879**
Figure 10A, B

New records. BRAZIL • 1 ♂; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00084.

Figure 10. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–B.** *Microvelia mimula*, macropterous male. **A.** Dorsal view. **B.** Ventral view. **C–H.** *Microvelia pulchella*. **C, D.** Macropterous male. **C.** Dorsal view. **D.** Ventral view. **E, F.** Apterous male. **E.** Dorsal view. **F.** Ventral view. **G, H.** Apterous female. **G.** Dorsal view. **H.** Ventral view. **I–K.** *Microvelia venustatis*, macropterous male. **I.** Dorsal view. **J.** Ventral view. **K.** Head, frontolateral view, showing fusiform antennomere IV.

Identification. Our single male of this species was identified based on the proctiger with a pair of lateral, long, horn-like projections (Fig. 10B) (Moreira 2012).

Distribution in Brazil. AM, PA, MA*, CE, MT, MS, MG, ES, SP, RJ, SC.

Microvelia pulchella Westwood, 1834

Figure 10C–H

New records. BRAZIL • 3 ♂, 3 ♀; Maranhão, Aldeias Altas, Cheio d'água lagoon; −04.64352, −043.51263; 20 Sep. 2019; C.L. Franco et al. leg.; LEAq 00234, 00237, 00273 • 38 ♂, 46 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00108, 00111, 00115, 00206–00208, 00210–00211, 00214–00215, 00225, 00232.

Identification. Our material of this species was identified based on the following characters: apterous specimens with the mesonotum exposed, not covered by the pronotum (Fig. 10E, G); male elongated, subcylindrical; female broad, rounded; male hind tibia bent (Fig. 10D); male terminalia aligned with the longitudinal axis of the body; and male abdominal segment VIII ventrally

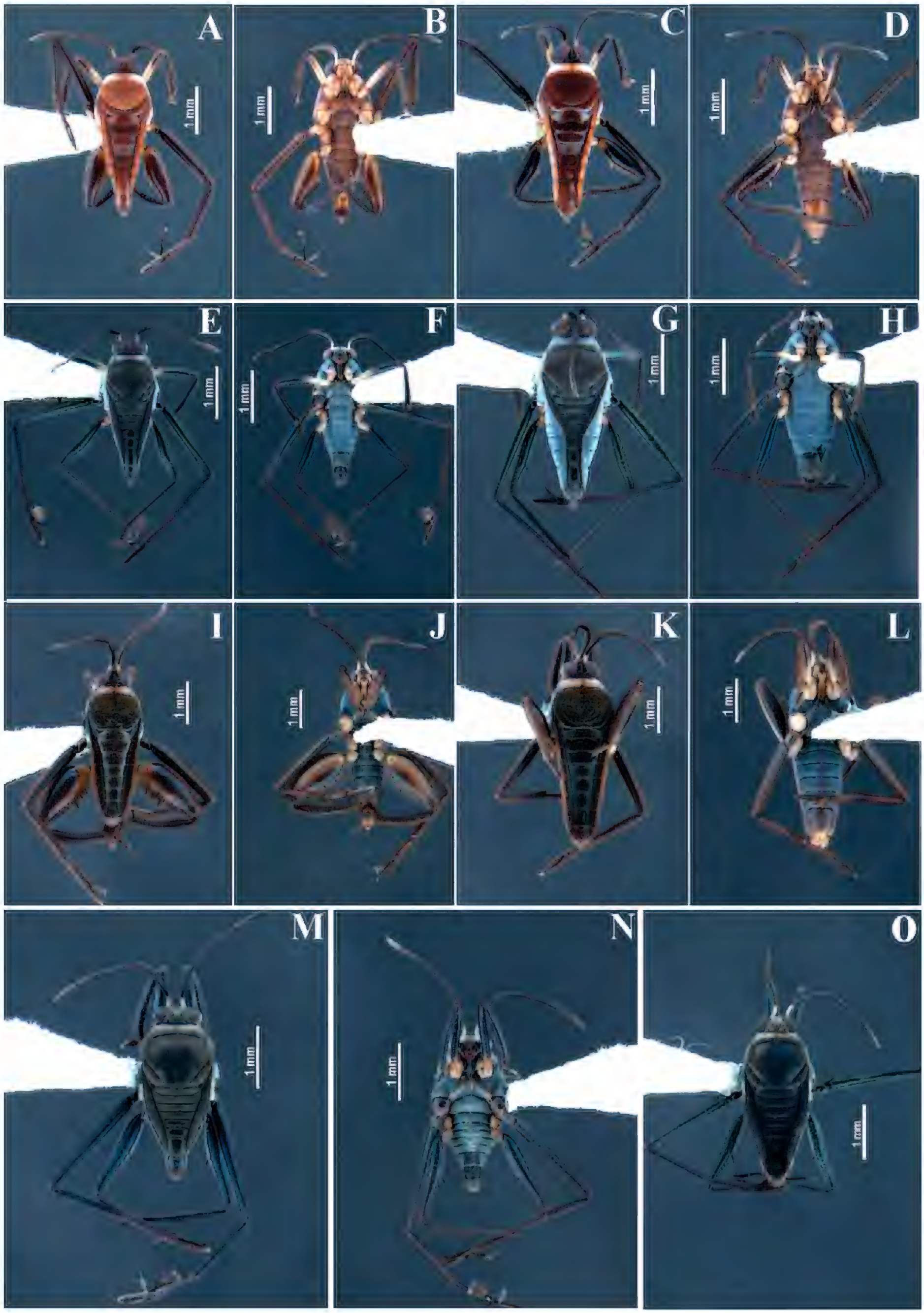

Figure 11. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–D.** *Rhagovelia brunae*. **A, B.** Apterous male. **A.** Dorsal view. **B.** Ventral view. **C, D.** Apterous female. **C.** Dorsal view. **D.** Ventral view. **E–H.** *Rhagovelia hambletoni*. **E, F.** Apterous male. **E.** Dorsal view. **F.** Ventral view. **G, H.** Apterous female. **G.** Dorsal view. **H.** Ventral view. **I–L.** *Rhagovelia robusta*. **I, J.** Apterous male. **I.** Dorsal view. **J.** Ventral view. **K, L.** Apterous female. **K.** Dorsal view. **L.** Ventral view. **M–O.** *Rhagovelia tenuipes*. **M, N.** Apterous male. **M.** Dorsal view. **N.** Ventral view. **O.** Apterous female, dorsal view.

without depressions, projections, or notches (Moreira 2012).

Distribution in Brazil. AM, PA, MA, PI, PE, BA, AL, MS, MG, ES, SP, RJ, SC.

Comments. Previously recorded from northern Maranhão state, in the municipality of São Luís (Moreira and Campos 2012).

***Microvelia venustatis* Drake & Harris, 1933**
Figure 10I–K

New records. BRAZIL • 2 ♂; Maranhão, São João do Soter, Fonte Mariana stream; −05.12666, −043.84111; 23 Dec. 2019; C.L. Franco et al. leg.; LEAq 00257, 00266 • 1 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00271.

Identification. Our material was identified based on the body about 1.30 mm long, mainly black, with an orange mark on the pronotum; antennomere IV fusiform, 4.5 times or longer than the largest width, thicker than I–III (Fig. 10K); and the male terminalia small and strongly inserted into the abdomen (Fig. 10J) (Moreira 2012).

Distribution in Brazil. AM, PA, MA, MT, MG, ES, SP, RJ, SC.

Comments. Previously recorded from northern Maranhão state, in the municipality of São Luís (Moreira and Campos 2012).

Subfamily Rhagoveliinae
Rhagovelia Mayr, 1865

***Rhagovelia brunae* Magalhães & Moreira, 2016**
Figure 11A–D

New records. BRAZIL • 45 ♂, 44 ♀; Maranhão, Codó, Baixa Grande II stream; −04.73222, −043.70638, 05 Oct. 2019; C.L. Franco et al. leg.; LEAq 00185, 00187, 00189 • 106 ♂, 107 ♀; Maranhão, Caxias, Buriti stream; −04.91500, −043.11333; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00150, 00156, 00161, 00162, 00169, 00170 • 1 ♀; Maranhão, Codó, Buriti Corrente stream; −04.75194, −043.66638; 04 Oct. 2019; C.L. Franco et al. leg.; LEAq 00272 • 1 ♂, 3 ♀; Maranhão, Caxias, Inhamum stream; −04.89833, −043.43333; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00025, 00088 • 3 ♂, 31 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00126, 00138, 00148 • 21 ♂, 23 ♀; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00276.

Identification. Our material was identified based on the apterous males, which have the pronotum long, completely covering the mesonotum (Fig. 11A); the hind trochanter with a few small spines and a larger apical spine; the hind tibia with small subequal spines throughout its length and a straight apical spur; and the sides of abdominal segment VII with patches of small black denticles (Magalhães et al. 2016). Females were associated with males from the same locality based on the general appearance and by comparison with the original description of the species.

Distribution in Brazil. PA, MA*.

***Rhagovelia hambletoni* Drake & Harris, 1933**
Figure 11E–H

New records. BRAZIL • 5 ♂, 5 ♀; Maranhão, Caxias, Baixa Grande stream; −04.75722, −043.66055, 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00004 • 1 ♂; Maranhão, Caxias, Batatal stream; −04.96166, −043.38916; 07 Aug. 2019; C.L. Franco et al. leg.; LEAq 00008 • 18 ♂, 9 ♀; Maranhão, Codó, Buriti Corrente stream; −04.75194, −043.66638; 04 Oct. 2019; C.L. Franco et al. leg.; LEAq 00184 • 63 ♂, 44 ♀; Maranhão, Aldeias Altas, Poção stream; −04.67388, −043.54138; 27 Aug. 2019; C.L. Franco et al. leg.; LEAq 00107, 00113, 00119, 00221 00223, 00226, 00227, 00229, 00230.

Identification. Both males and females of *R. hambletoni* could be reliably identified. The pronotum is short, not covering the mesonotum (Fig. 11E, G), like in other species of the *angustipes* complex (Polhemus 1997). Males lack a spine on the fore trochanter, have black middle coxa (Fig. 11F), bear about seven spines on the hind femur, display shiny black areas dorsally on the center of abdominal segments V–VIII (Fig. 11E), and have laterotergites gradually tapering posteriorly (Fig. 11E). Females have hind trochanter yellowish (Fig. 11H), hind femur with three to five spines, and abdominal laterotergites reflected over the mediotergites (Fig. 11G) (Moreira 2012).

Distribution in Brazil. MA*, BA, MT, MS, MG, ES, SP, RJ.

***Rhagovelia robusta* Gould, 1931**
Figure 11I–L

New records. BRAZIL • 24 ♂, 128 ♀; Maranhão, Caxias, Correntinho stream; −04.82666, −043.37694; 26 Aug. 2019; C.L. Franco et al. leg.; LEAq 00059, 00063, 00067, 00074, 00082 • 1 ♂, 3 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00177, 00178 • 25 ♂, 31 ♀; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00276.

Identification. Our males of *R. robusta* were identified based on the pronotum long, completely covering the mesonotum, mostly blackish, strongly contrasting with a yellowish-brown mark on the anterior lobe (Fig. 11I); jugum and proepisternum with minute black denticles; the hind trochanter with spines; the hind femur with three irregular rows of spines, with a large spine near its middle dorsally displaced from the others; and the sides of abdominal segment VII without patches of black denticles (Magalhães et al. 2016). Females were associated with males from the same locality based on the general appearance and by comparison with reference material from other Brazilian states.

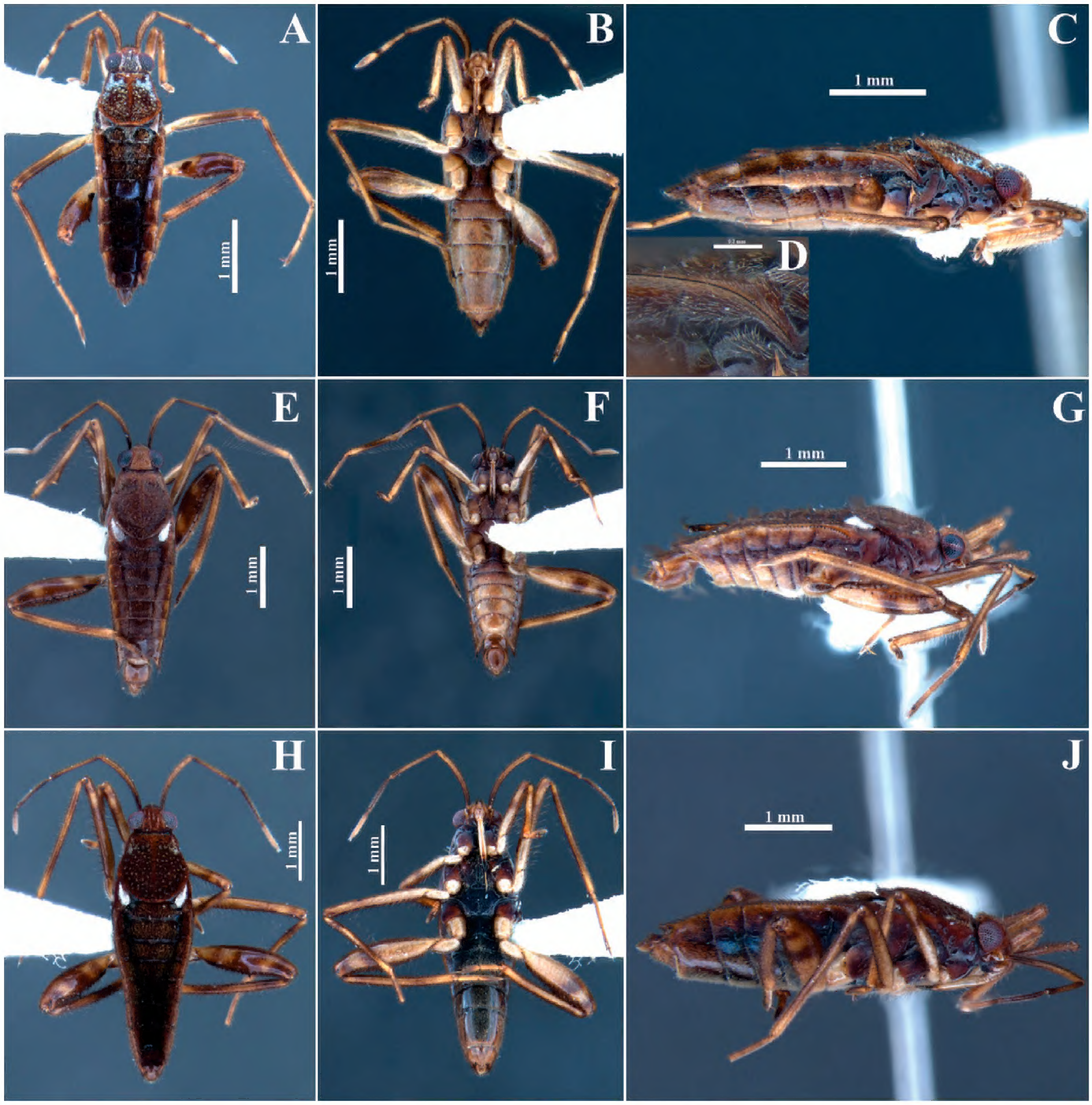

Figure 12. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–D.** *Stridulivelia astralis*, apterous female. **A.** Dorsal view. **B.** Ventral view. **C.** Lateral view. **D.** Detail of stridulatory structure on abdominal laterotergite. **E–J.** *Stridulivelia ayacucho*. **E–G.** Micropterous male. **E.** Dorsal view. **F.** Ventral view. **G.** Lateral view. **H–J.** Micropterous female. **H.** Dorsal view. **I.** Ventral view. **J.** Lateral view.

Distribution in Brazil. PA, MA*, SE, MT, GO, MG, ES, SP, RJ, SC.

Rhagovelia tenuipes Champion, 1898

Figure 11M–O

New records. BRAZIL • 2 ♀; Maranhão, Caxias, Baixa Grande stream; −04.75722, −043.66055, 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00267 • 36 ♂, 19 ♀; Maranhão, Caxias, Primavera stream; −04.84916, −043.49527; 06 Aug. 2019; C.L. Franco et al. leg.; LEAq 00176 • 150 ♂, 112 ♀; Maranhão, Codó, Saco river; −04.62482, −043.90249; 02 Oct. 2019; C.L. Franco et al. leg.; LEAq 00275.

Identification. Like *R. hambletoni*, *R. tenuipes* belongs to the *angustipes* complex of species (Polhemus 1997). Our males could be distinguished from *R. hambletoni* by the abdominal laterotergites bowed laterally and the longer hind femur, slightly longer than half of the body length (Fig. 11M). Females of *R. tenuipes* were easily distinguished from those of *R. hambletoni* based on the laterotergites not reflected over the mediotergites (Fig. 11O) and the hind femur with at least seven spines (Moreira 2012).

Distribution in Brazil. RR, AM, PA, MA*, MT, MS, MG, ES, SP, RJ.

Subfamily Veliinae
Stridulivelia Hungerford, 1929

Stridulivelia astralis (Drake & Harris, 1938)

Figure 12A–D

New records. BRAZIL • 2 ♀; Maranhão, Caxias, Barra-

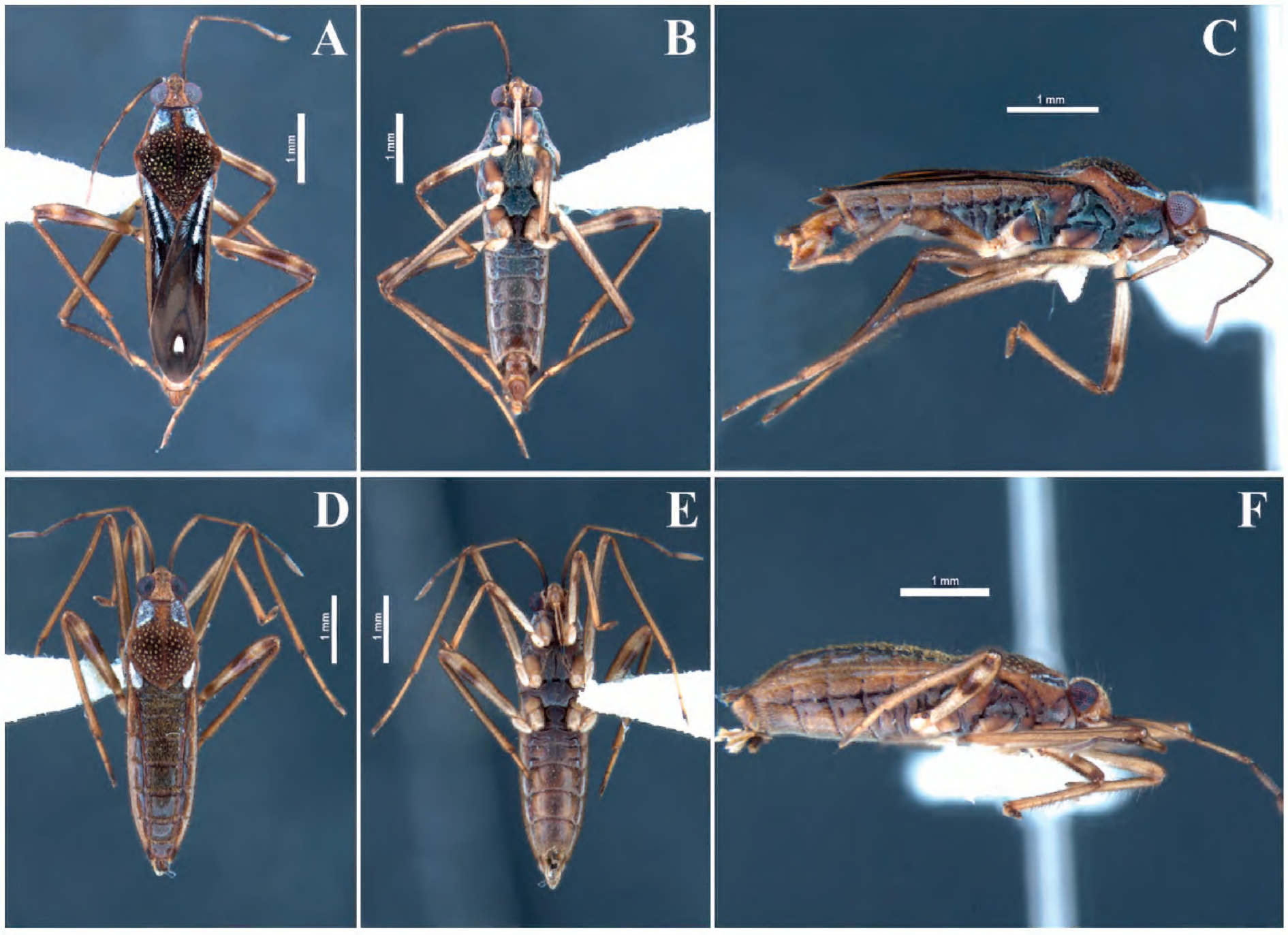

Figure 13. Gerromorpha from eastern Maranhão state, northeastern Brazil. **A–F.** *Stridulivelia tersa*. **A–C.** Macropterous male **A.** Dorsal view. **B.** Ventral view. **C.** Lateral view. **D–F.** Micropterous female. **D.** Dorsal view. **E.** Ventral view. **F.** Lateral view.

gem stream; −04.87562, −043.09894; 10 Dec. 2019; C.L. Franco et al. leg.; LEAq 00283.

Identification. Our material of this genus was identified based on the key provided by Floriano et al. (2017). The females above lack spines on the humeral angles (Fig. 12A); have the stridulatory structure on the lateral margin of the abdominal laterotergites formed by a row of tightly packed minute pegs (Fig. 12D); the first three visible abdominal segments with transverse lateral sulci; the hind femur incrassate, about two times wider than the middle femur, with a spine on the distal two-thirds of the posterior margin distinctly larger than others (Fig. 12A); and the dorsum of abdominal segment VIII without projections.

Distribution in Brazil. TO, MA*, MT, MS, MG.

Stridulivelia ayacucho Polhemus & Spangler, 1995

Figure 12E–J

New records. BRAZIL • 3 ♂; Maranhão, Codó, Baixa Grande II stream; −04.73222, −043.70638, 05 Oct. 2019; C.L. Franco et al. leg.; LEAq 00197 • 1 ♀; Maranhão, Caxias, Barragem stream; −04.87562, −043.09894; 10 Dec. 2019; C.L. Franco et al. leg.; LEAq 00284 • 1 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00135.

Identification. The specimens above differ from *S. astralis* by the stridulatory structure on the lateral margin of the laterotergites formed by a row of widely separated knob-like denticles (Fig. 12G, J). The male has the venter of abdominal segment VIII centrally expanded but not forming a lobule, and the female has short posterior projections on the dorsum of abdominal segment VIII, with about one-third the length of the segment at the midline (Floriano et al. 2017).

Distribution in Brazil. PA, MA*, MT, MG, SP.

Stridulivelia tersa (Drake & Harris, 1941)

Figure 13A–F

New records. BRAZIL • 1 ♂; Maranhão, Caxias, Areia Branca stream; −05.03720, −043.48580; 13 Aug. 2019; C.L. Franco et al. leg.; LEAq 00242 • 2 ♂; Maranhão, Codó, Baixa Grande II stream; −04.73222, −043.70638, 05 Oct. 2019; C.L. Franco et al. leg.; LEAq 00198 • 1 ♂, 2 ♀; Maranhão, Caxias, Barragem stream; −04.87562, −043.09894; 10 Dec. 2019; C.L. Franco et al. leg.; LEAq 00239 • 1 ♂, 1 ♀; Maranhão, Caxias, Jatobá stream; −04.90972, −043.11666; 28 Aug. 2019; C.L. Franco et al. leg.; LEAq 00125.

Identification. Like *S. ayacucho*, our specimens of *S. tersa* have the stridulatory structure on the lateral margin of the abdominal laterotergites formed by a row of widely separated knob-like denticles (Fig. 13C, F).

However, they have the first four or five visible abdominal segments with transverse lateral sulci (two in *S. ayacucho*), and the female lacks projections on abdominal tergite VIII (present in *S. ayacucho*) (Floriano et al. 2017).

Distribution in Brazil. AM, PA, MA*, MT, MG, ES.

Discussion

We collected 1,778 specimens in the study area, representing 23 species of the five families of Gerromorpha recorded from Brazil (Moreira 2020a, 2020b, 2020c, 2020d, 2020e). Among the 11 species of the infraorder previously recorded from Maranhão state, we did not examine material of *Halobates micans*, *Brachymetra furva*, *Rhagovelia whitei*, *Paravelia cognata*, *P. micromaculata*, *P. nexa*, *P. spinifera*, and *Steinovelia vinnula*. *Halobates micans* is one of the five species of insects that live on the open ocean (Andersen and Cheng 2004), whereas *B. furva* has questionable validity and is being revised (Cordeiro 2017). The absence of *R. whitei* in the samples is unexpected, because it is a common species in the Cerrado biome (Dias-Silva et al. 2013; Giehl et al. 2020). The other species above are rare and known from material obtained on at most three localities each, except for *P. spinifera*, which seems to be more common than the rest between western Maranhão state and Suriname (Rodrigues et al. 2014).

The present study adds 20 species to the fauna of Gerromorpha from Maranhão, increasing the known diversity of the area to 31 species. Further collections on central and western Maranhão will surely provide additional first records from the state and from northeastern Brazil because the aquatic insects of the Amazonian portion of the state are still poorly known (Costa et al. 2016).

Acknowledgements

CLF received a master's scholarship from the Fundação de Amparo à Pesquisa e ao Desenvolvimento Científico e Tecnológico do Maranhão (#BM-04042/19) and thanks the Programa de Pós-graduação em Biodiversidade, Ambiente e Saúde, Centro de Estudos Superiores de Caxias, Universidade Estadual do Maranhão, for logistical support. JMSR benefited from a postdoctoral fellowship (#202.317/2018) provided by the Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ). FFFM benefited from grants provided by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (#301942/2019-6) and FAPERJ (#E-26/203.207/2017).

Authors' Contributions

CLF collected and identified specimens, produced the map, and wrote the manuscript. JMSR identified and photographed specimens. FFFM revised identifications. JMSR, CASA, and FFFM revised the manuscript.

References

Andersen NM (1982) The semiaquatic bugs (Hemiptera, Gerromorpha). Phylogeny, adaptations, biogeography and classification. Entomonograph 3: 1–455.

Andersen NM, Cheng L (2004) The marine insect *Halobates* (Heteroptera: Gerridae): biology, adaptations, distribution, and phylogeny. Oceanography and Marine Biology: An Annual Review 42: 119–180. https://doi.org/10.1201/9780203507810

Cordeiro IRS (2017) Revisão taxonômica de *Brachymetra* Mayr, 1865 (Insecta: Heteroptera: Gerridae). Master thesis, Universidade Federal Rural do Rio de Janeiro, Rio de Janeiro, Brazil, 96 pp.

Correia Filho FL, Gomes ÉR, Nunes OO, Lopes Filho JB (2011) Relatório diagnóstico do município de Caxias. Projeto cadastro de fontes de abastecimento por água subterrânea, Estado do Maranhão, CPRM – Serviço Geológico do Brasil, Teresina, Brazil. http://rigeo.cprm.gov.br/jspui/handle/doc/15431. Accessed on: 2020-10-19.

Costa MKL, Chaves LPFA, Silva RA, Siqueira GM (2016) Considerations over the biogeography of the West Mesoregion of Maranhão (Brazil). Journal of Geospatial Modelling 1 (1): 41–51. https://doi.org/10.22615/jgm-1.1-5813

Coutinho LM (2006) O conceito de bioma. Acta Botanica Brasilica 20 (1): 13–23. https://doi.org/10.1590/S0102-33062006000100002

Dias-Silva K, Moreira FFF, Giehl NFS, Nóbrega CC, Cabette HSR (2013) Gerromorpha (Hemiptera: Heteroptera) of eastern Mato Grosso state, Brazil: checklist, new records, and species distribution modeling. Zootaxa 3736 (3): 201–235. https://doi.org/10.11646/zootaxa.3736.3.1

Drake CJ, Chapman HC (1958) New Neotropical Hebridae, including a catalogue of the American species (Hemiptera). Journal of the Washington Academy of Sciences 48 (10): 317–326.

Floriano CFB, Paladini A, Cavichioli RR (2016) Systematics of the South American species of *Cylindrostethus* Mayr, 1865 (Hemiptera: Heteroptera: Gerridae), with a new species from Amazonian Brazil and Peru. Invertebrate Systematics 30 (5): 431–462. https://doi.org/10.1071/IS14059

Floriano CFB, Moreira FFF, Bispo PC (2017) South American Species of *Stridulivelia* (Hemiptera: Heteroptera: Veliidae): identification key, diagnoses, illustrations, and updated distribution. Proceedings of the Entomological Society of Washington 119 (1): 24–46. https://doi.org/10.4289/0013-8797.119.1.24

Giehl NFS, Cabette, HSR, Dias-Silva K, Juen L, Moreira FFF, de Castro LA, Ferreira VRS, Batista JD (2020) Variation in the diversity of semiaquatic bugs (Insecta: Heteroptera: Gerromorpha) in altered and preserved veredas. Hydrobiologia 847 (16): 3497–3510. https://doi.org/10.1007/s10750-020-04364-1

Gullan PJ, Cranston PS (2017) Insetos. Fundamentos da entomologia. Guanabara Koogan, Rio de Janeiro, Brazil, 436 pp.

Hungerford HB (1954) The genus *Rheumatobates* Bergroth (Hemiptera–Gerridae). University of Kansas Science Bulletin 36 (7): 529–588. https://doi.org/10.5962/bhl.part.24625

IBGE (Instituto Brasileiro de Geografia e Estatística) (2020) Cidades e estados. https://www.ibge.gov.br/cidades-e-estados.html?view=municipio. Accessed on: 2020-10-12.

Lima GP, Neto CAAP, Amaral, YT, Siqueira GM (2016) Biogeographical characterization of the Maranhense Eastern Mesoregion (Brazil). Journal of Geospatial Modelling 1 (1): 1–12. https://doi.org/10.22615/jgm-1.1-5809

Magalhães OM, Moreira FFF, Galvão C (2016) A new species of *Rhagovelia* Mayr, 1865 (Hemiptera: Heteroptera: Veliidae) from Pará state, with an updated key to Brazilian species of the *robusta* group. Zootaxa 4171 (3): 586–594. https://doi.org/10.11646/zootaxa.4171.3.12

Medeiros RN (2015) Visões da natureza. In: Sousa IG, Meneses RL, Vianna JM (Eds) Cartografias invisíveis: saberes e sentires de Caxias. Academia Caxiense de Letras, Caxias, Brazil, 25–49.

Morales-Castaño IT, Molano-Rendón F (2009) Revisión de los géne-

ros *Eurygerris* y *Tachygerris* (Hemiptera: Tachygerrini) para la región neotropical. Revista Mexicana de Biodiversidad 80: 395–410. https://doi.org/10.22201/ib.20078706e.2009.002.608

Moreira FFF (2012) Sinopse da fauna de Veliidae (Insecta: Heteroptera: Gerromorpha) ocorrente na Região Sudeste do Brasil. PhD dissertation, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, 369 pp.

Moreira FFF (2020a) Gerridae. In: Catálogo taxonômico da fauna do Brasil. Programa das Nações Unidas para o Desenvolvimento, Brasília, Brazil. https://fauna.jbrj.gov.br/fauna/faunadobrasil/2377. Accessed on: 2020-10-12.

Moreira FFF (2020b) Hebridae. In: Catálogo taxonômico da fauna do Brasil. Programa das Nações Unidas para o Desenvolvimento, Brasília, Brazil. https://fauna.jbrj.gov.br/fauna/faunadobrasil/1882. Accessed on: 2020-10-12.

Moreira FFF (2020c) Hydrometridae. In: Catálogo taxonômico da fauna do Brasil. Programa das Nações Unidas para o Desenvolvimento, Brasília, Brazil. https://fauna.jbrj.gov.br/fauna/faunadobrasil/948. Accessed on: 2020-10-12.

Moreira FFF (2020d) Mesoveliidae. In: Catálogo taxonômico da fauna do Brasil. Programa das Nações Unidas para o Desenvolvimento, Brasília, Brazil. https://fauna.jbrj.gov.br/fauna/faunadobrasil/1841. Accessed on: 2020-10-12.

Moreira FFF (2020e) Veliidae. In: Catálogo taxonômico da fauna do Brasil. Programa das Nações Unidas para o Desenvolvimento, Brasília, Brazil. https://fauna.jbrj.gov.br/fauna/faunadobrasil/1596. Accessed on: 2020-10-12.

Moreira FFF, Campos GGF (2012) New distributional data concerning some Gerromorpha (Insecta: Hemiptera: Heteroptera) from Brazil. Check List 8 (3): 542–547. https://doi.org/10.15560/8.3.542

Moreira FFF, Barbosa JF (2013) A new *Hydrometra* (Hemiptera: Heteroptera: Hydrometridae) from northeastern Brazil, with a key to the species recorded from the country. Zootaxa 3619 (1): 70–74. https://doi.org/10.11646/zootaxa.3619.1.4

Moreira FFF, Ribeiro JRI, Nessimian JL (2008) A synopsis of the species of *Mesovelia* (Insecta: Heteroptera: Mesoveliidae) occurring in the floodplain of the Amazon River, Brazil, with redescriptions of *Mesovelia mulsanti* White and *M. zeteki* Harris & Drake. Acta Amazonia 38 (3): 539–550. https://doi.org/10.1590/S0044-59672008000300020

Moreira FFF, Barbosa JF, Ribeiro JRI, Alecrim VP (2011) Checklist and distribution of semiaquatic and aquatic Heteroptera (Gerromorpha and Nepomorpha) occurring in Brazil. Zootaxa 2958 (1): 1–74. https://doi.org/10.11646/zootaxa.2958.1.1

Nieser N (1970) Gerridae of Suriname and the Amazon with additional records of other neotropical species. Studies on the fauna of Suriname and other Guyanas 12 (47): 94–138.

Nieser N (1994) A new species and a new status in *Neogerris* Matsumura (Heteroptera: Gerridae) with a key to American species. Storkia 3: 27–37.

Nieser N, Melo AL (1997) Os heterópteros aquáticos de Minas Gerais. Guia introdutório com chave de identificação para as espécies de Nepomorpha e Gerromorpha. Universidade Federal de Minas Gerais, Belo Horizonte, Brazil, 180 pp.

Nieser N, Melo AL (1999) A new species of *Halobatopsis* (Heteroptera: Gerridae) from Minas Gerais (Brazil), with a key to the species. Entomologische Berichten 59 (7): 97–102.

Panizzi AR, Grazia J (2015) True Bugs (Heteroptera) of the Neotropics. Springer Science+Business Media, Dordrecht, the Netherlands, 901 pp. https://doi.org/10.1007/978-94-017-9861-7

Polhemus DA (1997) Systematics of the genus *Rhagovelia* Mayr (Heteroptera: Veliidae) in the Western Hemisphere (exclusive of the *angustipes* complex). Entomological Society of America, Lanham, USA, 386 pp.

Polhemus JT, Polhemus DA (2008) Global diversity of true bugs (Heteroptera; Insecta) in freshwater. Hydrobiologia 595: 379–391. https://doi.org/10.1007/s10750-007-9033-1

QGIS.org (2020) QGIS Geographic Information System, Open Source Geospatial Foundation. https://qgis.osgeo.org/. Accessed on: 2020-10-12.

Rodrigues HDD, Álvarez-Arango LF (2019) A new species of *Oiovelia* from Colombia, with notes for other three species of South American Veliinae (Heteroptera: Gerromorpha: Veliidae). Papéis Avulsos de Zoologia 59: e20195935. https://doi.org/10.11606/1807-0205/2019.59.35

Rodrigues HDD, Melo AL, Ferreira-Kepler RL (2012) New records of Gerromorpha (Insecta: Hemiptera: Heteroptera) from Brazil. Check List 8 (5): 908–913. https://doi.org/10.15560/8.5.908

Rodrigues HDD, Moreira FFF, Nieser N, Chen P-P, Melo AL, Dias-Silva K, Giehl NFS (2014) The genus *Paravelia* Breddin, 1898 (Hemiptera: Heteroptera: Veliidae) in Brazil, with descriptions of eight new species. Zootaxa 3784 (1): 1–47. https://doi.org/10.11646/zootaxa.3784.1.1

Schuh RT, Slater JA (1995) True bugs of the world (Hemiptera: Heteroptera). Classification and natural history. Cornell University Press, Ithaca, USA, 336 pp.

Spangler PJ (1990) A new species of halophilous water-strider, *Mesovelia polhemusi*, from Belize and a key and checklist of New World species of the genus (Heteroptera: Mesoveliidae). Proceedings of the Biological Society of Washington 103 (1): 86–94.

Tannus JLS, Assis MA (2004) Composição de espécies vasculares de campo sujo e campo úmido em área de cerrado, Itirapina - SP, Brasil. Revista Brasileira de Botânica 27 (3): 489–506. https://doi.org/10.1590/S0100-84042004000300009